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HOSPITAL TECHNICAL MEMORANDUM

PROTECTION OF CONDENSATE SYSTEMS: FILMING AMINES

6

Department of Health and Social Security: London

Welsh Office: Cardiff

Hospital Technical Memorandum Number 6

Protection of Condensate Systems: Filming Amines

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I. Scope

1. The condensate from a steam boiler installation frequently contains oxygen and carbon-dioxide in solution. Such condensate will cause corrosion of unprotected steel pipes and other steel or iron components of the condensate return system. One method used for the protection of these parts of condensate systems liable to attack involves the addition to the steam systems of amine compounds. These protect in two ways; neutralising amines act as direct neutralisers of the carbon-dioxide in the condensate; and filming amines form a molecular film on the internal surface of the pipes to prevent oxidation. This memorandum discusses the application and control of amine compounds and precautions to be observed in their use.

Pipes and other components made of copper and some forms of stainless steel are not usually liable to attack.

II. General

2. The term "amines" covers a large group of organic compounds having varying degrees of toxicity. Neutralising amines include compounds such as morpholine and cyclohexylamine and are poisonous. They act as direct neutralisers of carbon-dioxide and, for certain applications, are being superseded by filming amines.

3. Some filming amines employ octadecylamine. They are of lower toxicity than other filming amines and may be applied in smaller concentration than the neutralising type.

III. Application in hospitals

4. As far as is known, filming amines are the only kind being used at the present time in boiler plants in National Health Service Hospitals.

5. They are obtained and applied in the following ways: in solid form as tablets administered through a dispenser on the boiler; as a solid form amine which is emulsified and injected into the steam or condensate return mains by a proportioning pump; and as an emulsion, which may or may not require to be diluted, which is also injected into the steam or condensate return mains by a proportioning pump. In all cases the manufacturer's recommended handling precautions for these toxic chemicals should be carefully followed.

6. Specific dosage rates cannot be quoted since they can be determined only by operating experience with each individual system. Representative manufacturers suggest that a filming amine concentration of 0·5 parts per million *in the condensate* should be satisfactory in low make-up systems and 1·5 parts per million in average industrial installations. The minimum dosing required to inhibit corrosion should be used, but under no circumstances should a concentration of 3·0 parts per million in the condensate be exceeded. A factor to be borne in mind is that filming amine already deposited may be re-evaporated, thus causing local concentrations higher than the dosage rate.

Dosing methods—proportioning pumps

7. Accurate dosing methods should be employed. The only satisfactory method is to apply the amine in fluid form of a specific concentration by means of a proportioning pump coupled to the main boiler feed water pump. The proportioning pump should inject the liquid into the feed line as close to the boiler as possible. Injection of the fluid into a saturated steam-line may not be satisfactory since complete vapourisation is difficult to attain.

Tests

8. Two types of tests are available, qualitative and quantitative. The qualitative tests merely indicate the presence or otherwise of amines in the condensate. The quantitative tests show the actual concentration and are the only positive way of checking. They involve the application of specialised techniques which, although straightforward, require care in execution. Advice on these is obtainable from the makers of the testing equipment.

9. It is necessary for the level of filming amine concentration to be checked at frequent intervals. Test samples may be taken either from a steam main and condensed or from a condensate line.

10. The sampling should be taken via a cooling coil (to prevent flash) from a flowing line rather than a condensate receiver. A commercially made sampling unit is available for taking samples from a steam line. Alternatively, the sample may be obtained from a slow running draw-off cock at low level on a condensate return line, provided no flashing occurs.

11. Filming amines in water are rapidly absorbed on to the surface of glass or polythene. To prevent this the collecting vessels should be treated with a silicone.

12. The test sample must not be allowed to stand in the collecting vessel for more than one hour. Synthetic detergents must not be used for cleaning these containers. Rinsing with distilled water is sufficient.

IV. Restrictions on use of amines

Cooking and food processing

13. Where it can be guaranteed that the concentration will never at any time exceed 3 p.p.m., boiler steam containing octadecylamine may be used for food processing in wet steaming ovens where the boiler steam is in contact with the food. No other filming or other amine should be allowed to come into contact with food or foodstuffs: they have a particular affinity for milk and lard. Where (as, for example, in wet steaming ovens) steam containing amines other than octadecylamine comes into contact with food, or where it could do so fortuitously, a steam generator fed from the main steam-line is necessary to provide steam completely free from such other amines. Regular tests should be carried out to ensure that the condensate from kitchen processes is free from amines other than octadecylamine as a precaution against the failure of a steam generator tube.

Sterilizing

14. Although there is doubt about the amount of deposition of filming amines in sterilizing processes employing steam containing octadecylamine or other amines, and about the effects such deposits might have on instruments, fluids, babies' feeding bottles, etc., steam containing up to 2·4 p.p.m. of octadecylamine may be used for such sterilizing processes.

Distilled water

15. Where distilled water is produced from steam generated from water containing octadecylamine or other amines the system must be such that none appears in the distilled water.

Milk kitchens

16. Babies' milk should not be brought into contact with steam containing octadecylamine or other amines.

Other additives

17. This memorandum deals with amines. There are other substances which are added to boiler water and some of these may be harmful. In cases of doubt reference should be made to the Hospital Medical Officer.

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